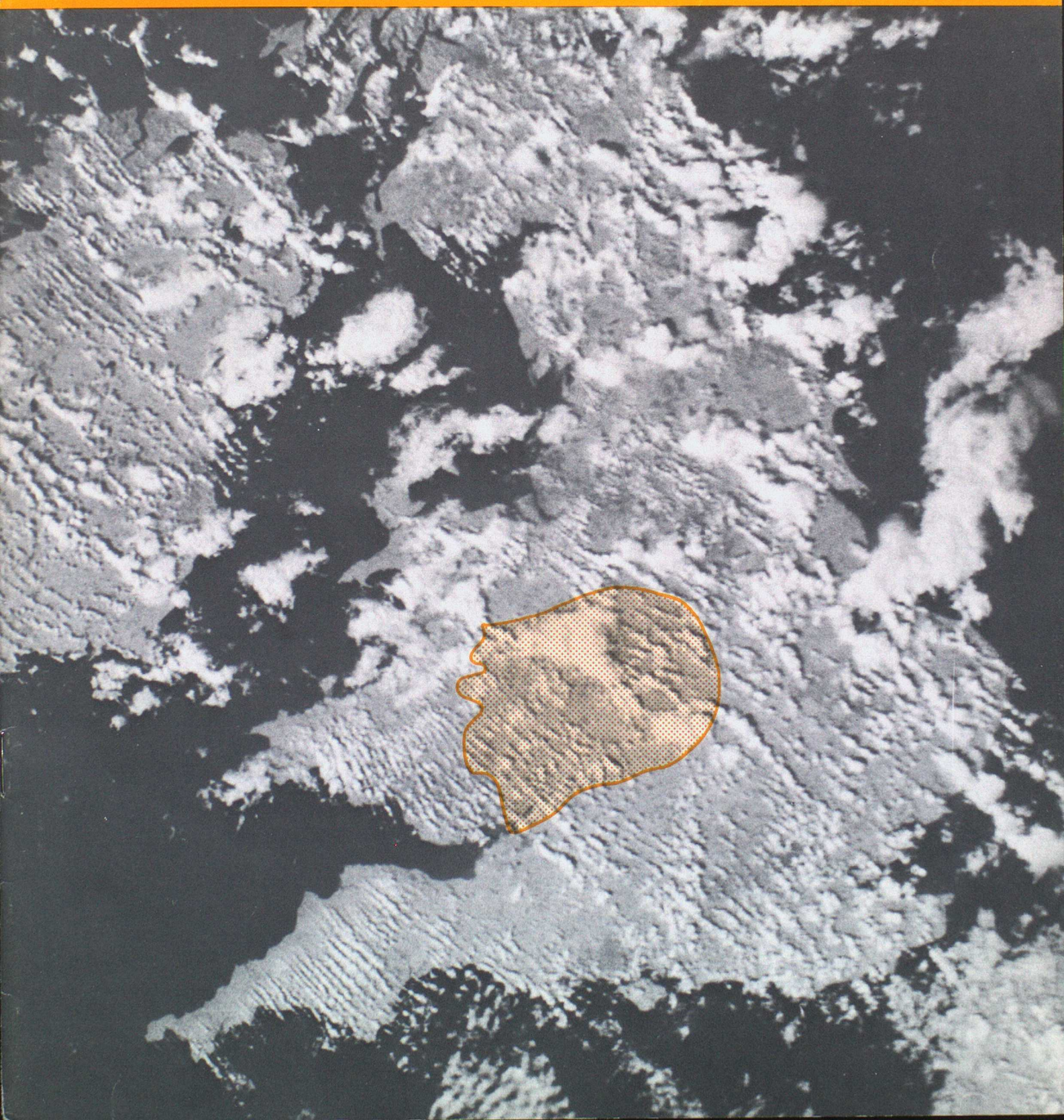
# THE CLIMATE OF GREAT BRITAIN

# THE MIDLANDS

Climatological Memorandum 132



*1st edition 1982*
*Revised 1986*

**Published by the Meteorological Office**
**London Road, Bracknell, Berkshire RG12 2SZ**

© *Crown copyright 1986*

UDC 551.582 (424 + 425)
ISBN 0 86180 216 0

The front cover shows a view of England and Wales from the Satellite Tiros-N taken at 1518 GMT on Wednesday, 2 April 1980 – photograph by courtesy of the Department of Electrical Engineering and Electronics, University of Dundee.

An anticyclone was situated to the south-west of the British Isles and a showery north-westerly airstream covered Britain. The alignment of the clouds with the surface wind is clearly seen. The Midlands had about 8 hours of sunshine with a few rain showers mainly in the afternoon and maximum temperatures about 12°C.

# THE CLIMATE OF GREAT BRITAIN

## Climatological Memorandum 132

# The Midlands

### INTRODUCTION

**This memorandum is one of a series which will cover the whole of Great Britain and seeks to present the main features of the climate of the area in a form suitable for use in schools and by members of the general public.**

**There is an Introduction to the series (Climatological Memorandum 113) which explains how the various weather elements are measured and defines some of the more common terms.**

**Industrial and commercial interests who are concerned with meteorological information for planning and design will probably require more complex analyses of the available data, and details of the services offered by the Meteorological Office to meet those needs are given on page 16.**

### CONTENTS


| | |
|---|---|
| The Area | 2 |
| Temperature | 3 |
| Humidity | 6 |
| Sunshine | 6 |
| Rainfall | 8 |
| Thunder and Hail | 9 |
| Snow | 10 |
| Cloud | 11 |
| Visibility | 13 |
| Wind | 14 |
| Weather extremes | 15 |
| Comparison with other areas of the United Kingdom | 16 |
| Climatological Services available from the Meteorological Office | 16 |
| Weather Centres and Public Service Offices | 17 |


Met O 3 (Advisory Services)

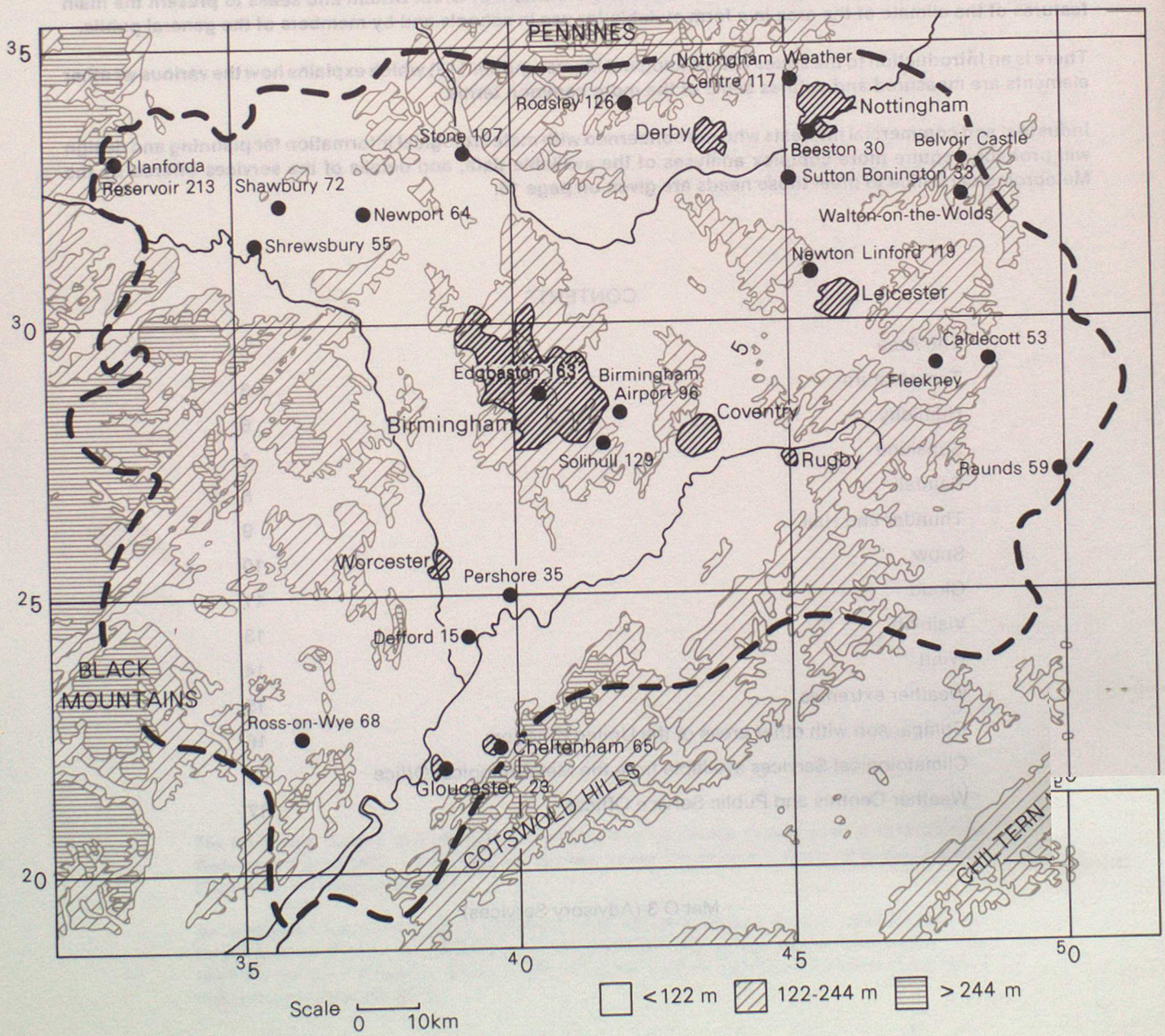
## THE AREA

The Midlands area is bounded by the Welsh mountains to the west, the Cotswolds (and their northward extension) to the south, the high ground of the southern Pennines to the north and includes the Northamptonshire uplands in the east. It comprises the Severn and Avon valleys with their rivers flowing to the south and the Trent valley trending from west to east across the northern part of the region. Between these valleys is the Birmingham plateau. The Severn and Avon valleys combine in the Vale of Evesham which, with its rich alluvial soil, is noted for its fruit-growing industry. To the west of the River Severn are the foothills of the Welsh mountains – broken country of sandstone hills and valleys supporting dairy and cattle farming. The ground rises to about 540 metres in the Clee hills. To the south and east of the River Avon the limestone uplands of the Cotswolds rise in a steep escarpment in the south, extending in more gentle slopes into Northamptonshire and Leicestershire. In the centre of the region is the plateau, altitude about 100–150 metres, of Birmingham and the Black Country, the main industrial part of the region. To the north and east of this plateau are the upper reaches of the Trent valley with its industrial towns of Nottingham and Derby, and the Nottingham coalfield in the east.

The map below shows the topography of the region and the locations of the climatological and rainfall stations for which data are given in this memorandum.

Details of the northern section of this region are also included in Climatological Memorandum 131 – The Trent Valley.

**Topography of the Midlands and locations and altitudes (in metres) of the stations. Co-ordinates are National Grid references.**



# TEMPERATURE

Mean annual temperatures over the region vary from around 9 °C to just over 10 °C. The highest values occur in the lower parts of the Severn valley while the lowest values tend to occur at the higher altitude locations. Over the British Isles mean annual temperatures range from about 7 °C over the Shetlands to over 10 °C in the extreme south-west of England and the Channel Islands.

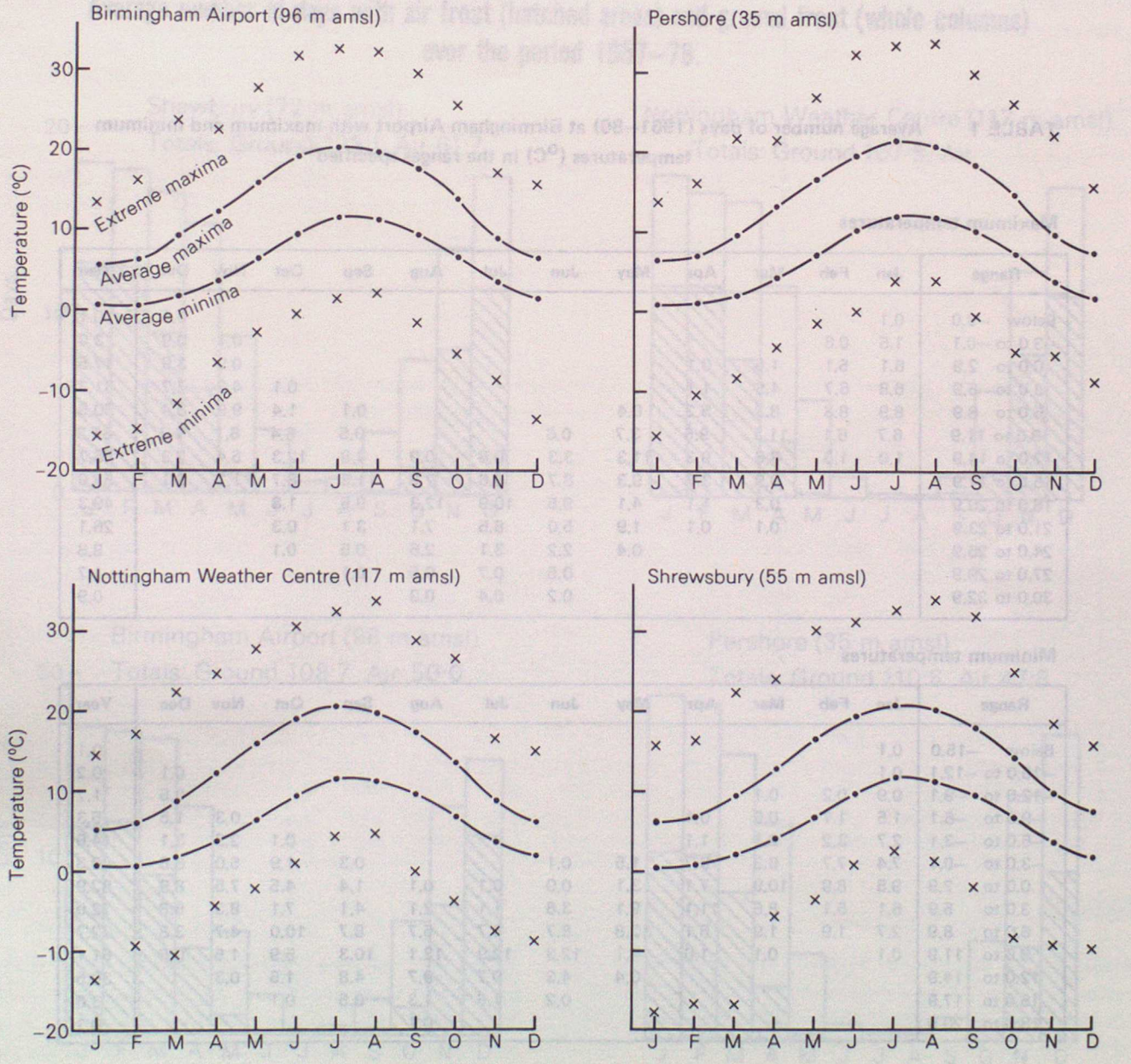
Temperatures show both a seasonal and diurnal variation. Minimum temperatures usually occur around sunrise and maximum temperatures normally two or three hours after midday. January is the coldest month in the Midlands with mean minimum temperatures varying from just below 0 °C to over 1.5 °C. This compares with −1.0 °C in parts of Tayside and Grampian region to over 5.5 °C in the Isles of Scilly. The higher values in the region occur in the lower Severn valley and are due to the incursion of milder maritime air via the Bristol Channel.

Extreme minimum temperatures usually occur in January with the absolute minimum for the region of −26.1 °C at Newport, Shropshire in January 1982.

July is the warmest month with mean maximum temperatures as high as 21.5 °C. The highest mean July temperatures in Great Britain occur in the London area at 22.5 °C whilst the lowest of around 15 °C occur in the Shetlands. Extreme maximum temperatures occur in July or August. During the heat wave of 1976 Cheltenham had the highest July temperature ever recorded in Great Britain with 35.9 °C on the 3rd. On 9 August 1911 the highest recorded United Kingdom temperature of 36.7 °C occurred at Raunds, Northamptonshire and also at Epsom and Canterbury.

The variation of mean maximum and mean minimum temperatures together with extreme temperatures recorded at four locations in the region are shown in the diagrams below.

## Annual variation of maximum and minimum temperatures over the period 1941-70 with extreme temperatures for periods up to 1978.



There is a marked similarity between the curves of mean values but more variation in the extremes which reflect the differing topography of the locations as well as the period over which the data have been recorded.

Table 1 gives the average number of days each month of maximum and minimum temperatures at Birmingham Airport in specified ranges. The most striking feature of the table is the wide range of both maximum and minimum temperatures at any time of year. From the table it can be seen that at Birmingham Airport the temperature reaches or exceeds 30 °C about one day per year and fails to rise above freezing on about three days a year.

Table 2 compares the number of days of high and low temperatures at four locations in the region. Pershore has more occasions of high temperatures than the other locations owing to its lower altitude and local topographical effects. Shawbury has most instances of low temperatures while Nottingham Weather Centre has fewest, this being due in part to topographical differences between the two sites.

The average number of days of air frost varies in the region from about 40 in the lower Severn valley to over 60 a year in sheltered areas to the lee of the Welsh mountains. Ground frosts occur on average on 100 to 120 days each year.

The diagram opposite shows the frequency of air frost and ground frost at four locations in the region. This shows that a ground frost may occur at any time of year but the summer months are usually free of air frost. Nottingham Weather Centre has not had an air frost in the months from June to September since records began in 1948. There are great variations within these figures; for instance, in the period 1956–80 the number of days of air frost at Pershore varied from 19 in 1974 to 81 in 1963.

**TABLE 1** Average number of days (1961–80) at Birmingham Airport with maximum and minimum temperatures (°C) in the ranges specified

**Maximum temperatures**

| Range | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Below −3.0 | 0.1 | | | | | | | | | | | 0.1 | 0.1 |
| −3.0 to −0.1 | 1.5 | 0.6 | | | | | | | | | 0.1 | 0.9 | 3.0 |
| 0.0 to 2.9 | 6.1 | 5.1 | 1.5 | 0.1 | | | | | | | 0.9 | 3.9 | 17.5 |
| 3.0 to 5.9 | 6.8 | 6.7 | 4.9 | 1.1 | | | | | | 0.1 | 4.2 | 7.7 | 31.3 |
| 6.0 to 8.9 | 8.9 | 8.3 | 8.3 | 5.2 | 0.4 | | | | 0.1 | 1.4 | 9.6 | 8.4 | 50.5 |
| 9.0 to 11.9 | 6.7 | 6.1 | 11.3 | 9.5 | 3.7 | 0.6 | | | 0.5 | 6.4 | 8.7 | 7.7 | 61.3 |
| 12.0 to 14.9 | 1.0 | 1.5 | 3.8 | 9.3 | 11.3 | 3.3 | 0.8 | 0.9 | 4.8 | 12.3 | 5.4 | 2.3 | 56.7 |
| 15.0 to 17.9 | | | 0.9 | 3.7 | 9.3 | 8.7 | 6.6 | 7.5 | 11.5 | 8.7 | 1.1 | 0.1 | 58.0 |
| 18.0 to 20.9 | | | 0.3 | 1.1 | 4.1 | 9.5 | 10.9 | 12.3 | 9.5 | 1.8 | | | 49.3 |
| 21.0 to 23.9 | | | 0.1 | 0.1 | 1.9 | 5.0 | 8.5 | 7.1 | 3.1 | 0.3 | | | 26.1 |
| 24.0 to 26.9 | | | | | 0.4 | 2.2 | 3.1 | 2.6 | 0.5 | 0.1 | | | 8.8 |
| 27.0 to 29.9 | | | | | | 0.5 | 0.7 | 0.5 | 0.1 | | | | 1.7 |
| 30.0 to 32.9 | | | | | | 0.2 | 0.4 | 0.3 | | | | | 0.9 |

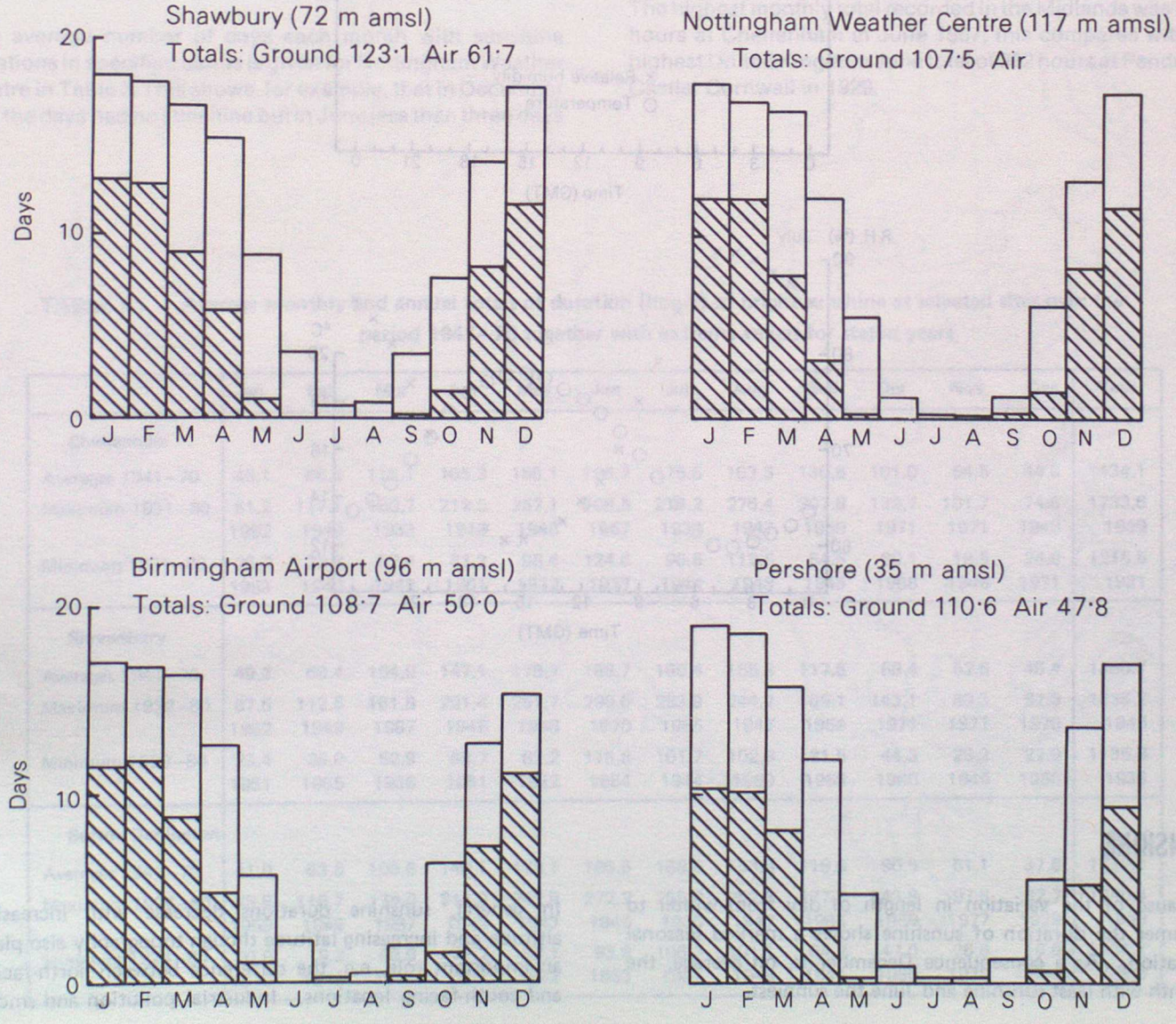
**Minimum temperatures**

| Range | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Below −15.0 | 0.1 | | | | | | | | | | | | 0.1 |
| −15.0 to −12.1 | 0.1 | | | | | | | | | | | 0.1 | 0.2 |
| −12.0 to −9.1 | 0.9 | 0.2 | 0.1 | | | | | | | | | 0.5 | 1.7 |
| −9.0 to −6.1 | 1.5 | 1.1 | 0.9 | 0.1 | | | | | | | 0.3 | 1.5 | 5.3 |
| −6.0 to −3.1 | 2.7 | 3.2 | 2.1 | 1.1 | | | | | | 0.1 | 2.3 | 3.1 | 14.6 |
| −3.0 to −0.1 | 7.4 | 7.7 | 6.3 | 3.7 | 1.5 | 0.1 | | | 0.3 | 1.9 | 5.0 | 6.6 | 40.3 |
| 0.0 to 2.9 | 9.5 | 8.9 | 10.9 | 7.1 | 3.1 | 0.9 | 0.1 | 0.1 | 1.4 | 4.5 | 7.5 | 8.9 | 62.9 |
| 3.0 to 5.9 | 6.1 | 5.1 | 8.6 | 11.1 | 9.1 | 3.6 | 1.1 | 2.1 | 4.1 | 7.1 | 8.3 | 5.8 | 72.0 |
| 6.0 to 8.9 | 2.7 | 1.9 | 1.9 | 6.1 | 12.8 | 8.7 | 5.7 | 5.7 | 8.7 | 10.0 | 4.7 | 3.8 | 72.7 |
| 9.0 to 11.9 | 0.1 | | 0.1 | 1.0 | 4.1 | 12.3 | 12.9 | 12.1 | 10.3 | 5.9 | 1.5 | 0.8 | 61.1 |
| 12.0 to 14.9 | | | | | 0.4 | 4.3 | 9.7 | 9.7 | 4.8 | 1.5 | 0.3 | | 30.5 |
| 15.0 to 17.9 | | | | | | 0.2 | 1.6 | 1.3 | 0.5 | 0.1 | | | 3.6 |
| 18.0 to 20.9 | | | | | | | | 0.1 | | | | | 0.1 |

**TABLE 2** Average number of days (1957–78) with maximum and minimum temperatures exceeding certain limits at selected sites in the Midlands

| Maximum temperature | 25.0 °C or more | | | | | | 30.0 °C or more | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | May | Jun | Jul | Aug | Sep | Oct | Jun | Jul | Aug | Sep |
| Birmingham A/P | 0.1 | 2.2 | 2.6 | 2.5 | 0.5 | 0.1 | 0.2 | 0.4 | 0.2 | |
| Nottingham W.C. | 0.4 | 2.8 | 2.9 | 3.5 | 0.6 | 0.1 | 0.3 | 0.6 | 0.2 | |
| Shawbury | 0.1 | 2.1 | 2.1 | 2.2 | 0.4 | <0.1 | 0.1 | 0.3 | 0.2 | |
| Pershore | 0.1 | 2.8 | 3.8 | 3.7 | 0.9 | 0.1 | 0.3 | 0.5 | 0.4 | 0.1 |
| **Minimum temperature** | **Less than −5.0 °C** | | | | | | **Less than −10.0 °C** | | | |
| | Nov | Dec | Jan | Feb | Mar | Apr | Dec | Jan | Feb | Mar |
| Birmingham A/P | 0.7 | 2.8 | 2.7 | 1.9 | 1.7 | 0.1 | 0.2 | 0.6 | 0.1 | 0.1 |
| Nottingham W.C. | 0.1 | 1.5 | 1.9 | 1.1 | 0.5 | | | 0.2 | 0.1 | <0.1 |
| Shawbury | 0.9 | 3.1 | 3.0 | 2.0 | 1.4 | 0.1 | 0.4 | 0.9 | 0.2 | 0.1 |
| Pershore | 0.5 | 2.6 | 2.5 | 1.0 | 1.4 | | 0.1 | 0.6 | 0.1 | <0.1 |

## Average number of days with air frost (hatched areas) and ground frost (whole columns) over the period 1957–78.


Shawbury (72 m amsl)
Totals: Ground 123·1 Air 61·7
Nottingham Weather Centre (117 m amsl)
Totals: Ground 107·5 Air
Birmingham Airport (96 m amsl)
Totals: Ground 108·7 Air 50·0
Pershore (35 m amsl)
Totals: Ground 110·6 Air 47·8
Days
20
10
0
J F M A M J J A S O N D

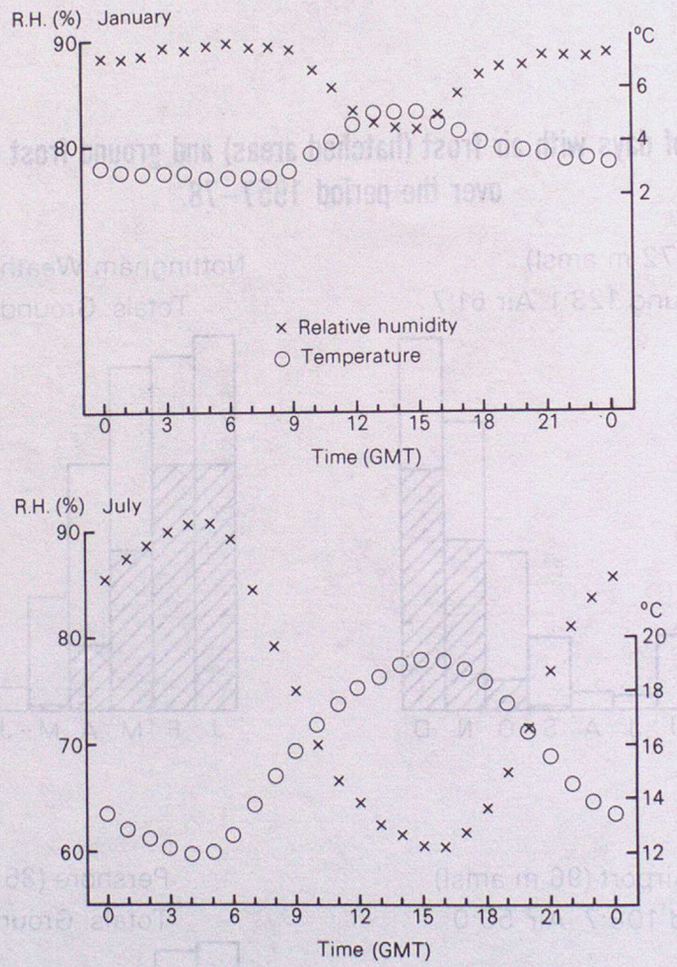
## HUMIDITY

Relative humidity, expressed as a percentage, is a measure of the amount of water vapour in the air compared to the maximum amount of water vapour which could be contained by the air at the same temperature. If the amount of water vapour remains constant, then as the temperature rises (or falls) the relative humidity decreases (or increases).

Relative humidity averages around 80 per cent over the year with higher values in winter than summer and at night than by day. This is primarily a reflection of the seasonal and diurnal temperature changes. Relative humidities equal or exceed 95 per cent for about 20 per cent of the time in the Midlands and 100 per cent can be reached in fog and during persistent rain or drizzle. Low relative humidities are less common. The lowest value ever recorded in Great Britain was 4 per cent at both Manchester Airport and Great Dun Fell, Cumbria on 29 March 1965.

The diagram below shows the average diurnal variation of temperature and relative humidity at Birmingham Airport for the months of January and July. This illustrates many of the points made in the text.

**Average diurnal variation of temperature and relative humidity at Birmingham Airport for January and July over the period 1957–78.**




## SUNSHINE

Because of the variation in length of day from winter to summer the duration of sunshine shows a marked seasonal variation. As a consequence December is, on average, the month with least sunshine and June the sunniest.

In general, sunshine durations decrease with increasing altitude and increasing latitude though topography also plays an important role, e.g. the difference between north-facing and south-facing locations. Industrial pollution and smoke

**TABLE 3** Average number of days of sunshine duration at Nottingham Weather Centre during the period 1957–78

(Frequency of occurrence in each 3-hour band in each month)

| Duration (Hours per day) | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No sunshine | 14.7 | 11.0 | 7.4 | 4.6 | 2.3 | 2.8 | 2.4 | 2.7 | 4.1 | 7.8 | 11.8 | 15.6 | 87.3 |
| 0.1 to 3.0 | 10.8 | 9.9 | 10.9 | 10.3 | 9.5 | 7.1 | 9.9 | 9.6 | 10.1 | 11.3 | 10.1 | 9.9 | 119.1 |
| 3.1 to 6.0 | 4.8 | 4.9 | 6.7 | 6.6 | 6.6 | 5.1 | 7.7 | 6.8 | 7.2 | 7.2 | 5.8 | 5.3 | 74.9 |
| 6.1 to 9.0 | 0.7 | 2.5 | 5.0 | 5.6 | 5.5 | 5.4 | 4.7 | 6.2 | 5.8 | 4.5 | 2.3 | 0.3 | 48.2 |
| 9.1 to 12.0 | | | 1.0 | 2.6 | 4.4 | 4.5 | 3.9 | 4.3 | 2.7 | 0.2 | | | 23.5 |
| More than 12.0 | | | | 0.2 | 2.7 | 5.2 | 2.5 | 1.4 | | | | | 12.1 |

haze can also reduce sunshine amounts but, since the introduction of the Clean Air Act, there has been an increase in sunshine durations over the industrial Midlands.

Average annual sunshine totals over the Midlands range from around 1250 hours to just over 1450 hours and reflect the influence of altitude and topography as well as that of industrial pollution. These figures compare with values of less than 1100 hours in the Shetland Islands to over 1750 hours along the south coast of England. The sunniest place in Great Britain is St Helier, Jersey with an annual average over the period 1951–80 of 1928 hours.

The average number of days each month with sunshine durations in specified bands is given for Nottingham Weather Centre in Table 3. This shows, for example, that in December half the days had no sunshine but in June less than three days had none. This is due, in part, to the differences in the length of day as well as to the weather types which predominate in these months.

Table 4 lists the average monthly and annual sunshine totals for the period 1941–70 for three locations plus the highest and lowest monthly totals for periods up to 1980. In recent years the lowest monthly total of sunshine was at Nottingham in December 1956 with 10.4 hours. The absolute minimum in Great Britain was in December 1890 at Westminster when no sunshine at all was recorded.

The highest monthly total recorded in the Midlands was 308.5 hours at Cheltenham in June 1957; this compares with the highest United Kingdom June total of 382 hours at Pendennis Castle, Cornwall in 1929.

**TABLE 4** Average monthly and annual totals of duration (hours) of bright sunshine at selected sites over the period 1941–70 together with extreme values for stated years

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cheltenham** | | | | | | | | | | | | | |
| Averages 1941–70 | 45.1 | 66.3 | 115.1 | 155.3 | 186.1 | 196.7 | 175.6 | 163.3 | 130.5 | 101.0 | 54.5 | 44.6 | 1434.1 |
| Maximum 1931–80 | 81.2 | 117.1 | 180.7 | 211.5 | 257.1 | 308.5 | 276.2 | 276.4 | 207.8 | 138.7 | 101.7 | 74.6 | 1733.6 |
| | 1952 | 1949 | 1933 | 1948 | 1948 | 1957 | 1934 | 1947 | 1959 | 1971 | 1971 | 1948 | 1949 |
| Minimum 1931–80 | 26.7 | 22.8 | 52.4 | 81.3 | 98.4 | 124.6 | 96.6 | 112.5 | 54.6 | 60.1 | 18.5 | 24.9 | 1215.5 |
| | 1953 | 1940 | 1942 | 1961 | 1932 | 1977 | 1944 | 1948 | 1945 | 1968 | 1945 | 1971 | 1931 |
| **Shrewsbury** | | | | | | | | | | | | | |
| Averages 1941–70 | 49.3 | 66.4 | 104.9 | 147.1 | 178.7 | 188.7 | 165.4 | 155.3 | 117.6 | 88.4 | 52.5 | 46.4 | 1360.7 |
| Maximum 1929–80 | 87.5 | 112.5 | 161.6 | 201.4 | 251.7 | 298.0 | 283.9 | 244.7 | 169.1 | 143.1 | 89.3 | 97.3 | 1635.2 |
| | 1952 | 1949 | 1967 | 1945 | 1948 | 1970 | 1955 | 1947 | 1954 | 1971 | 1971 | 1976 | 1949 |
| Minimum 1929–80 | 23.4 | 26.9 | 52.9 | 64.7 | 82.2 | 116.8 | 101.7 | 102.8 | 81.5 | 44.3 | 25.3 | 22.9 | 1135.8 |
| | 1961 | 1965 | 1936 | 1961 | 1932 | 1954 | 1944 | 1980 | 1956 | 1960 | 1945 | 1958 | 1936 |
| **Sutton Bonington** | | | | | | | | | | | | | |
| Averages 1941–70 | 41.9 | 63.6 | 100.6 | 140.1 | 178.1 | 186.5 | 168.5 | 153.8 | 119.6 | 90.5 | 51.1 | 37.8 | 1332.1 |
| Maximum 1924–80 | 78.8 | 116.7 | 175.0 | 213.9 | 242.9 | 272.2 | 255.9 | 252.6 | 177.9 | 143.8 | 97.6 | 62.7 | 1640.4 |
| | 1959 | 1949 | 1967 | 1942 | 1943 | 1940 | 1935 | 1947 | 1964 | 1959 | 1977 | 1929 | 1959 |
| Minimum 1924–80 | 20.9 | 19.2 | 46.0 | 77.2 | 92.1 | 93.9 | 106.3 | 101.1 | 64.2 | 47.0 | 26.6 | 16.0 | 1134.1 |
| | 1970 | 1940 | 1942 | 1961 | 1932 | 1953 | 1937 | 1948 | 1941 | 1960 | 1934 | 1958 | 1968 |

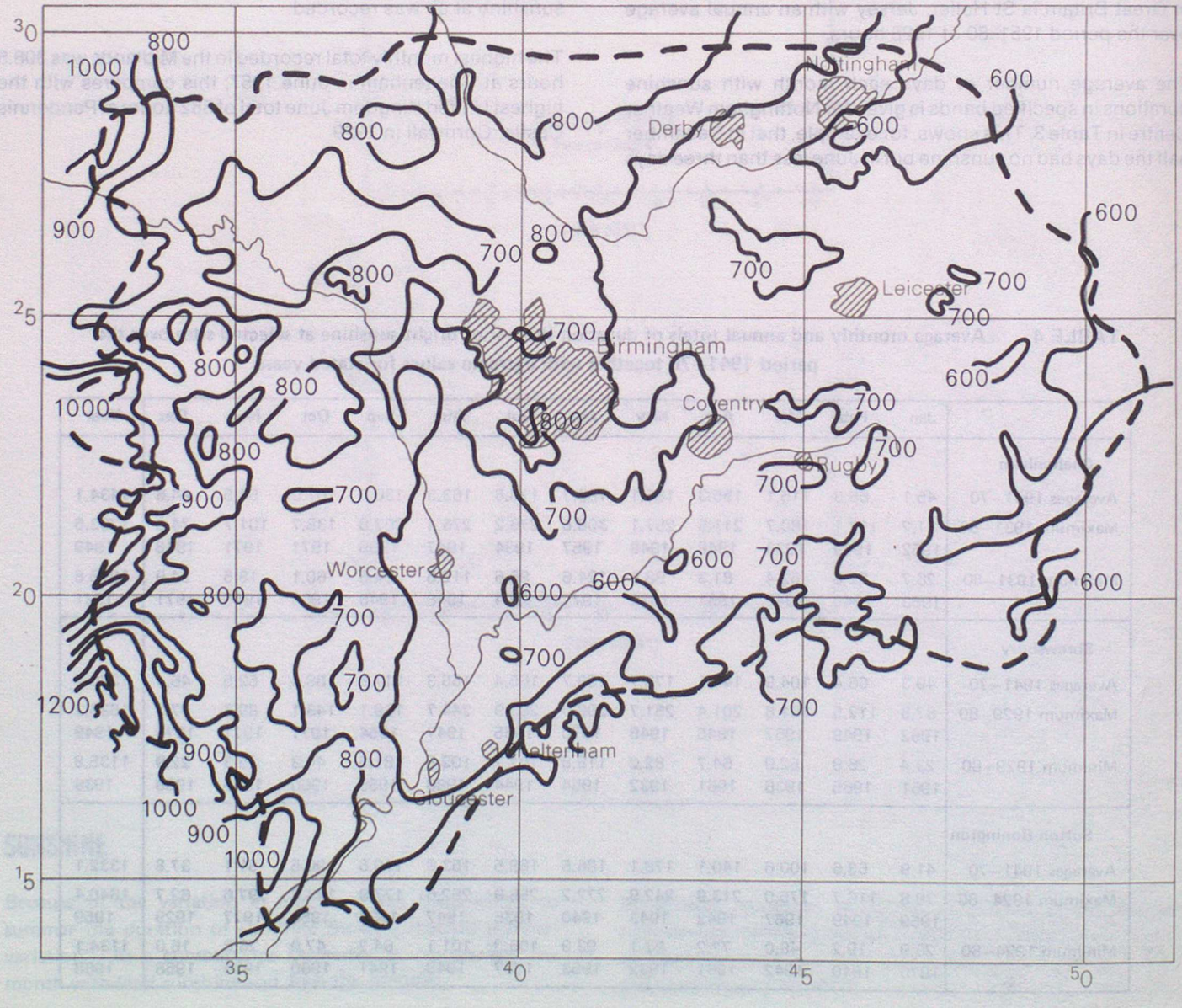
## RAINFALL

The distribution of rainfall over the United Kingdom is very much influenced by topography with the largest values occurring over the more mountainous regions and the smallest in the low-lying regions. In this text rainfall includes snow, sleet and hail in addition to rain as well as the small amounts from dew, hoar-frost and rime.

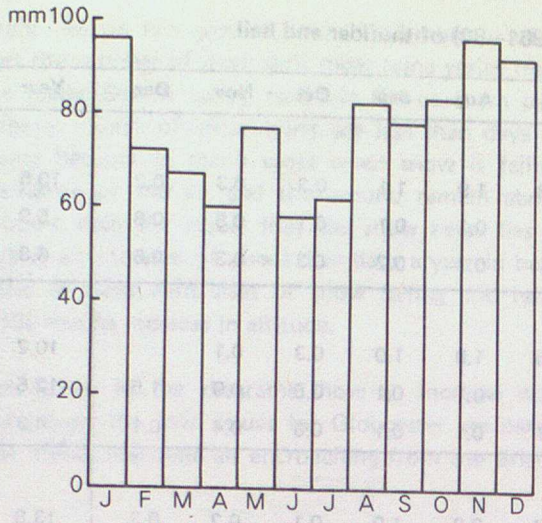
The nature of this rainfall varies during the year. In summer, rainfall is often of a showery nature falling over short periods and is normally more intense than winter rainfall which tends to be more frontal in character with falls occurring over longer periods. As a rough guide an average day of steady rain gives 10 to 15 mm and a heavy thunderstorm lasting an hour or so 25 to 50 mm. 25 mm of rainfall is equivalent to about 200 tonnes of water on a football pitch.

The diagram below shows the average annual rainfall over the Midlands region. The influence of topography on rainfall is clearly seen. The next diagram shows the monthly variation of rainfall for four locations in the region. These are typical of the region as a whole with August and November the wettest months and the period February to April the driest. Over the British Isles generally December and January are the wettest months and February to April the driest.

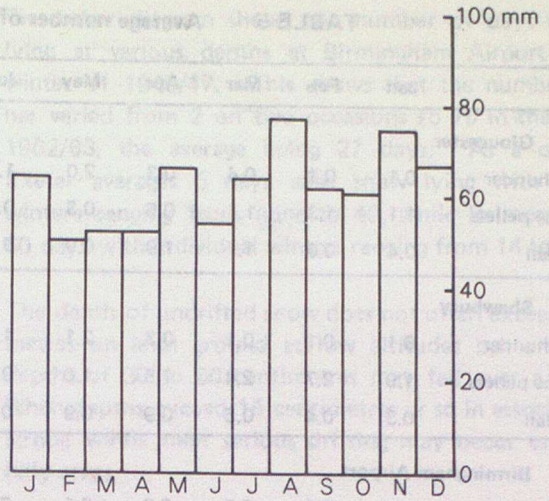
**Average annual rainfall (mm) over the period 1941–70. Co-ordinates are National Grid references.**



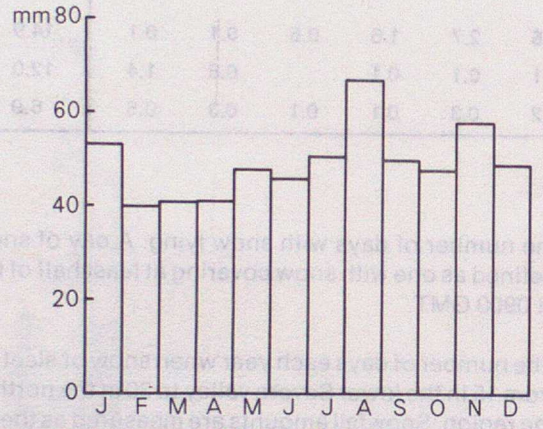
## Average monthly rainfall (mm) over the period 1941–70.



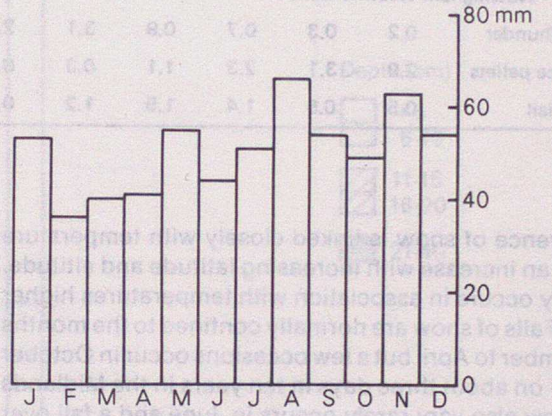

Llanforda Reservoir (213 m amsl)
(AAR 938 mm)




Solihull (129 m amsl)
(AAR 744 mm)




Beeston (30 m amsl)
(AAR 592 mm)




Defford (15 m amsl)
(AAR 606 mm)

amsl = above mean sea level AAR = Annual average rainfall

## THUNDER AND HAIL

Thunder and hail are both phenomena associated with cumulonimbus clouds, which are clouds of great vertical extent. A typical thundercloud reaches 18 000 feet and in summer may occasionally exceed 40 000 feet over the British Isles. Thunder is caused by the sudden heating and expansion of air along the path of the lightning.

Thunder an occur at any time of year but is more frequent during the summer months. In the Midlands region the number of days with thunder varies from around 10 in the Severn and Avon valleys to over 15 in the eastern part of the region. Thunder occurs most frequently in the British Isles over the Trent river basin and the southern part of the Vale of York with over 20 days a year on average. The majority of thunderstorms are triggered by convective processes either overland in summer or over a comparatively warm sea in winter.

In thunderstorms or heavy showers at any time of year the precipitation may be of hail or ice pellets. Both are in the form of hard, clear or opaque ice, the criterion between them being one of size. Hail has a diameter of 5 millimetres or more and ice pellets a diameter of less than 5 millimetres. Hail tends to have a maximum occurrence during the spring as it generally melts before reaching the ground in summer. Ice pellets are essentially a winter phenomenon occurring more frequently around coasts. Table 5 gives the average number of days of thunder and hail by month and year for four locations in the region.

Although hail and thunder can occur simultaneously most thunderstorm precipitation is of rain and the heaviest falls of rain over the British Isles are often associated with summer thunderstorms. Two of the most notable falls since 1900 over the Midlands were in thundery situations. On 11 June 1970, 67 mm (2.64 inches) of rain fell at Pershore, Hereford and Worcester in 25 minutes and 152 mm (5.97 inches) fell at Rodsley, Derbyshire in eight hours on 5 August 1957 which just happened to be a bank holiday. The largest ever fall of rain in a 24-hour period over the British Isles was also in a thundery situation when 279 mm (11 inches) were recorded at Martinstown, Dorset on 18 July 1955.

TABLE 5 Average number of days (1961–80) of thunder and hail

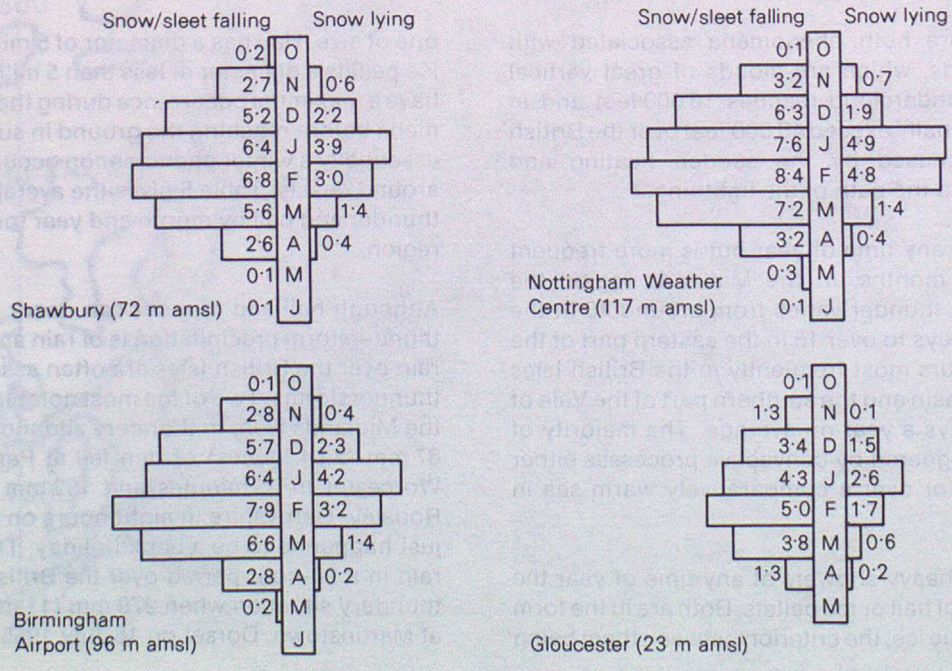
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Gloucester** | | | | | | | | | | | | | |
| Thunder | 0.1 | 0.1 | 0.4 | 0.3 | 2.0 | 1.8 | 1.8 | 1.9 | 1.1 | 0.3 | 0.3 | 0.2 | 10.5 |
| Ice pellets | 1.1 | 1.3 | 1.1 | 0.5 | 0.3 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.5 | 0.8 | 5.9 |
| Hail | 0.4 | 0.6 | 1.1 | 1.9 | 0.9 | 0.1 | 0.1 | 0.3 | 0.2 | 0.3 | 0.3 | 0.6 | 6.8 |
| **Shawbury** | | | | | | | | | | | | | |
| Thunder | 0.1 | 0.1 | 0.1 | 0.3 | 2.1 | 1.5 | 2.5 | 1.9 | 1.0 | 0.3 | 0.1 | | 10.2 |
| Ice pellets | 1.9 | 2.7 | 2.4 | 1.5 | 1.0 | 0.3 | | 0.1 | 0.1 | 0.5 | 0.9 | 1.5 | 12.5 |
| Hail | 0.3 | 0.4 | 0.5 | 0.9 | 0.9 | 0.1 | 0.1 | 0.1 | 0.1 | 0.3 | 0.4 | 0.1 | 4.3 |
| **Birmingham Airport** | | | | | | | | | | | | | |
| Thunder | 0.3 | 0.3 | 0.5 | 0.9 | 3.1 | 2.2 | 2.7 | 2.2 | 1.0 | 0.1 | 0.2 | 0.3 | 13.8 |
| Ice pellets | 1.3 | 2.9 | 1.8 | 0.7 | 0.3 | 0.1 | | 0.1 | 0.1 | 0.1 | 0.3 | 1.3 | 8.8 |
| Hail | 0.3 | 0.6 | 1.3 | 1.1 | 1.1 | 0.3 | 0.1 | 0.3 | 0.1 | 0.3 | 0.4 | 0.5 | 6.3 |
| **Nottingham Weather Centre** | | | | | | | | | | | | | |
| Thunder | 0.2 | 0.3 | 0.7 | 0.9 | 3.1 | 2.3 | 2.5 | 2.7 | 1.6 | 0.5 | 0.1 | 0.1 | 14.9 |
| Ice pellets | 2.9 | 3.1 | 2.3 | 1.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | | 0.8 | 1.4 | 12.0 |
| Hail | 0.5 | 0.5 | 1.4 | 1.5 | 1.2 | 0.4 | 0.2 | 0.3 | 0.1 | 0.1 | 0.3 | 0.5 | 6.9 |

## SNOW

The occurrence of snow is linked closely with temperature and shows an increase with increasing latitude and altitude. Snow rarely occurs in association with temperatures higher than 4 °C. Falls of snow are normally confined to the months from November to April but a few occasions occur in October and May — on about three days in ten years in the Midlands region. Snow also very rarely occurs in June and a fall over the Midlands on 2 June 1975 was the first recorded in summer since 1888. The diagram below shows, for four locations, the number of days with snow or sleet falling and the number of days with snow lying. A day of snow lying is defined as one with snow covering at least half of the ground at 0900 GMT.

The number of days each year when snow or sleet falls varies from 15 in the lower Severn valley to 30 in the northern part of the region. Snowfall amounts are measured as the equivalent water content and are included as such in the rainfall statistics. As a rough guide 12 centimetres of fresh snow is equivalent to 1 centimetre of rainfall.

**Average number of days per month at selected sites over the period 1961–78 with (a) snow/sleet falling and (b) snow lying at 0900 GMT.**



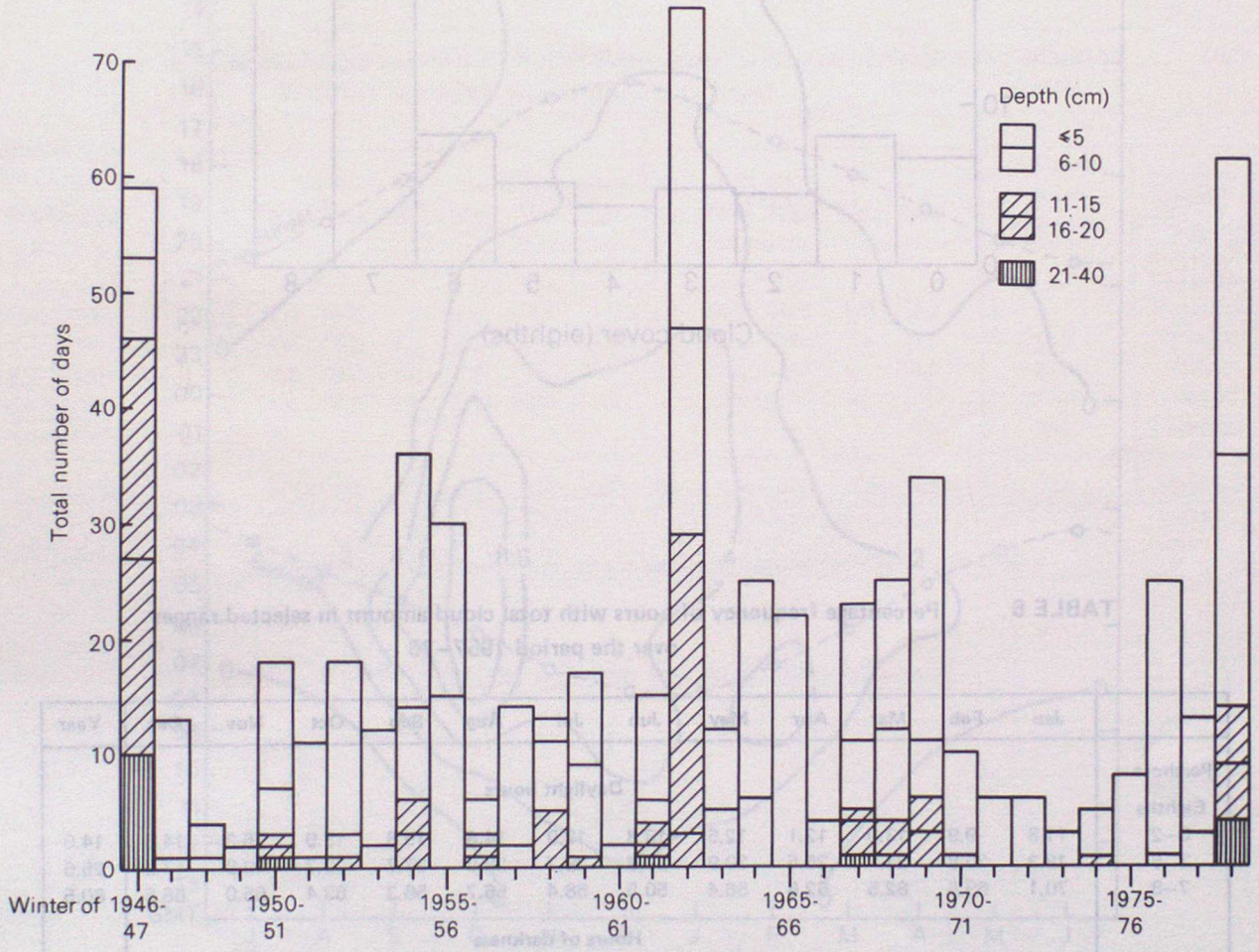
Snow rarely lies on low ground before December or after March and the number of days with snow lying varies from 12 in the lower Severn valley to 20 in the northern part of the region. Days of snow lying are less than days of snow falling because in many cases when snow is falling the temperature of the air and the ground remain above freezing point with the result that the snow never lies at all. There is an increase of about five days a year in both the number of days with sleet or snow falling and lying for each 100 metres increase in altitude.

The values given in the diagrams show an increase with altitude although the low values for Gloucester are partly a result of milder maritime air encroaching from the Bristol Channel.

The other diagram shows the number of days with snow lying at various depths at Birmingham Airport since the winter of 1946/47. This shows that the number of days has varied from 2 on two occasions to 75 in the winter of 1962/63, the average being 27 days. As a comparison Exeter averages 5 days with snow lying with individual winters ranging from none to 40, while Balmoral averages 60 days with individual winters ranging from 14 to 102 days.

The depth of undrifted snow does not often exceed 15 centimetres on level ground at low altitudes but on occasions depths of 30 to 60 centimetres may fall over a wide area. When depths exceed 15 centimetres or so in association with strong winds then serious drifting may occur especially in hilly areas.

**Number of days with total snow depth at 0900 GMT in stated ranges at Birmingham Airport.**




## CLOUD

Clouds are collections of very small water droplets, ice or a mixture of both. They are formed mainly as a result of cooling of air caused by ascent, as in convection, forced lifting over high ground, or in large-scale upward motions associated with fronts and depressions.

Cloud amounts are estimated as the fraction, in eighths, of the sky covered by cloud, with the figures 0 and 8 representing a completely clear and cloudy sky respectively. In this section the cloud ranges 0–2, 3–6 and 7–8 eighths will be used to approximate to clear skies, partly cloudy and cloudy respectively.

The diagram on page 12 shows the percentage frequency throughout the year for cloud amounts at Birmingham Airport. The values are typical of the Midland region with cloudy skies predominating. Over the country as a whole the values show a similar pattern.

Table 6 gives the percentage frequency by month and year for the hours of daylight and darkness for the three cloud ranges at Pershore and Shawbury. These are typical of the region, being more cloudy in winter than in summer and more cloudy by day than by night. June is the least cloudy month both by day, as reflected in the sunshine totals, and by night. Pershore has the greater incidence of clear skies of the two owing to its topography and lower altitude.

**Frequency of total cloud amount at Birmingham Airport over the period 1957–76.**

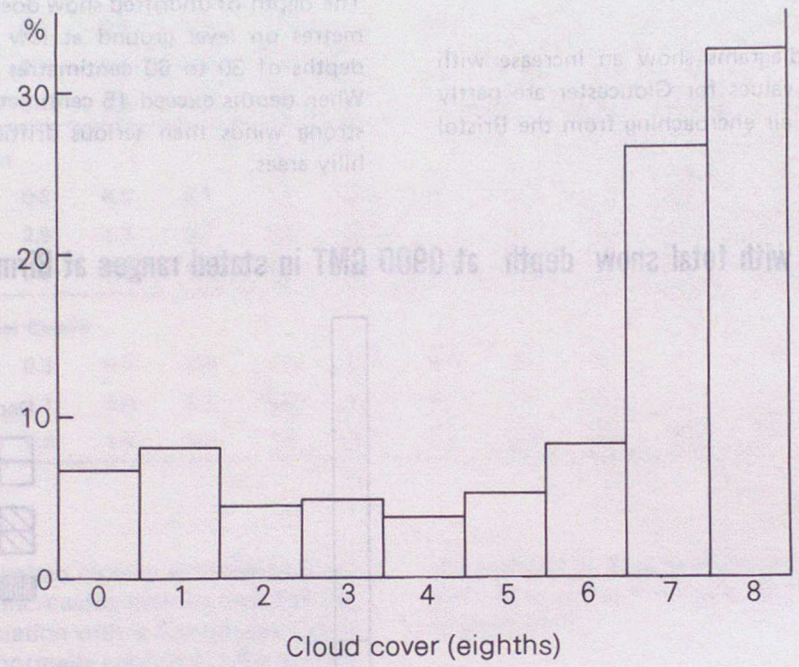



**TABLE 6** Percentage frequency of hours with total cloud amount in selected ranges over the period 1957–76

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Pershore** | | | | | | | | | | | | | |
| **Eighths** | | | | | | **Daylight hours** | | | | | | | |
| 0–2 | 11.8 | 9.9 | 13.9 | 12.1 | 12.5 | 18.8 | 12.9 | 14.6 | 15.8 | 13.9 | 15.3 | 14.5 | 14.0 |
| 3–6 | 18.3 | 20.8 | 23.4 | 25.5 | 30.9 | 30.6 | 28.7 | 28.8 | 27.7 | 22.7 | 19.9 | 17.2 | 25.6 |
| 7–8 | 70.1 | 69.5 | 62.5 | 62.6 | 56.4 | 50.5 | 58.4 | 56.7 | 56.3 | 63.4 | 65.0 | 68.5 | 60.5 |
| | | | | | | **Hours of darkness** | | | | | | | |
| 0–2 | 20.1 | 21.5 | 28.3 | 30.0 | 29.7 | 32.0 | 26.4 | 32.0 | 31.5 | 26.5 | 25.9 | 21.4 | 26.4 |
| 3–6 | 14.4 | 15.8 | 17.8 | 20.0 | 24.1 | 23.5 | 27.1 | 23.3 | 21.4 | 17.1 | 16.0 | 14.6 | 18.8 |
| 7–8 | 65.3 | 62.7 | 54.1 | 50.2 | 46.1 | 44.5 | 46.7 | 44.6 | 46.9 | 56.3 | 57.9 | 64.1 | 55.0 |
| **Shawbury** | | | | | | **Daylight hours** | | | | | | | |
| 0–2 | 10.6 | 8.9 | 11.3 | 10.3 | 10.0 | 17.0 | 8.4 | 11.2 | 10.5 | 9.9 | 12.8 | 13.3 | 11.1 |
| 3–6 | 19.9 | 21.4 | 26.7 | 30.4 | 34.2 | 31.7 | 32.9 | 31.3 | 31.2 | 26.0 | 23.8 | 21.5 | 28.6 |
| 7–8 | 69.5 | 69.7 | 61.9 | 59.1 | 55.9 | 51.4 | 58.7 | 57.6 | 58.3 | 64.2 | 63.4 | 65.3 | 60.2 |
| | | | | | | **Hours of darkness** | | | | | | | |
| 0–2 | 17.5 | 17.8 | 22.2 | 25.1 | 22.1 | 26.2 | 19.5 | 24.5 | 25.7 | 19.3 | 20.8 | 18.4 | 21.0 |
| 3–6 | 17.5 | 20.2 | 21.2 | 24.3 | 30.6 | 28.7 | 28.3 | 28.5 | 24.7 | 22.9 | 20.9 | 19.3 | 23.0 |
| 7–8 | 65.0 | 61.9 | 56.6 | 50.7 | 47.4 | 45.2 | 52.3 | 47.0 | 49.5 | 57.8 | 58.4 | 62.3 | 55.9 |

# VISIBILITY

Visibility is defined as the greatest horizontal distance at which an object can be discerned with the naked eye. It is of considerable importance to the community in general because the operation of various types of transport may be disrupted or stopped altogether if the visibility falls below certain limits. Variations in visibility occur with the different types of precipitation such as rain and snow, as well as with atmospheric pollution due to smoke and dust, but the really poor visibilities are due mainly to fog.

Fog is predominantly a winter phenomenon occurring generally at night or early morning though it does occasionally persist all day. There are a number of factors which affect fog formation and as a consequence there is a wide variation in the number of days when fog occurs at locations throughout the region. Fog and fog formation processes are discussed in the Introduction to the series.

The diagram below shows the distribution of thick fog at Birmingham Airport for each hour of the day throughout the year. This illustrates most of the points made here and in the Introduction to the series about the occurrence of fog.

Table 7 gives the number of days per month and year with fog at 0900 GMT for four locations. This shows the wide variations which can occur over relatively short distances.

**Percentage of time with visibility less than 200m at Birmingham Airport over the period 1957–78.**

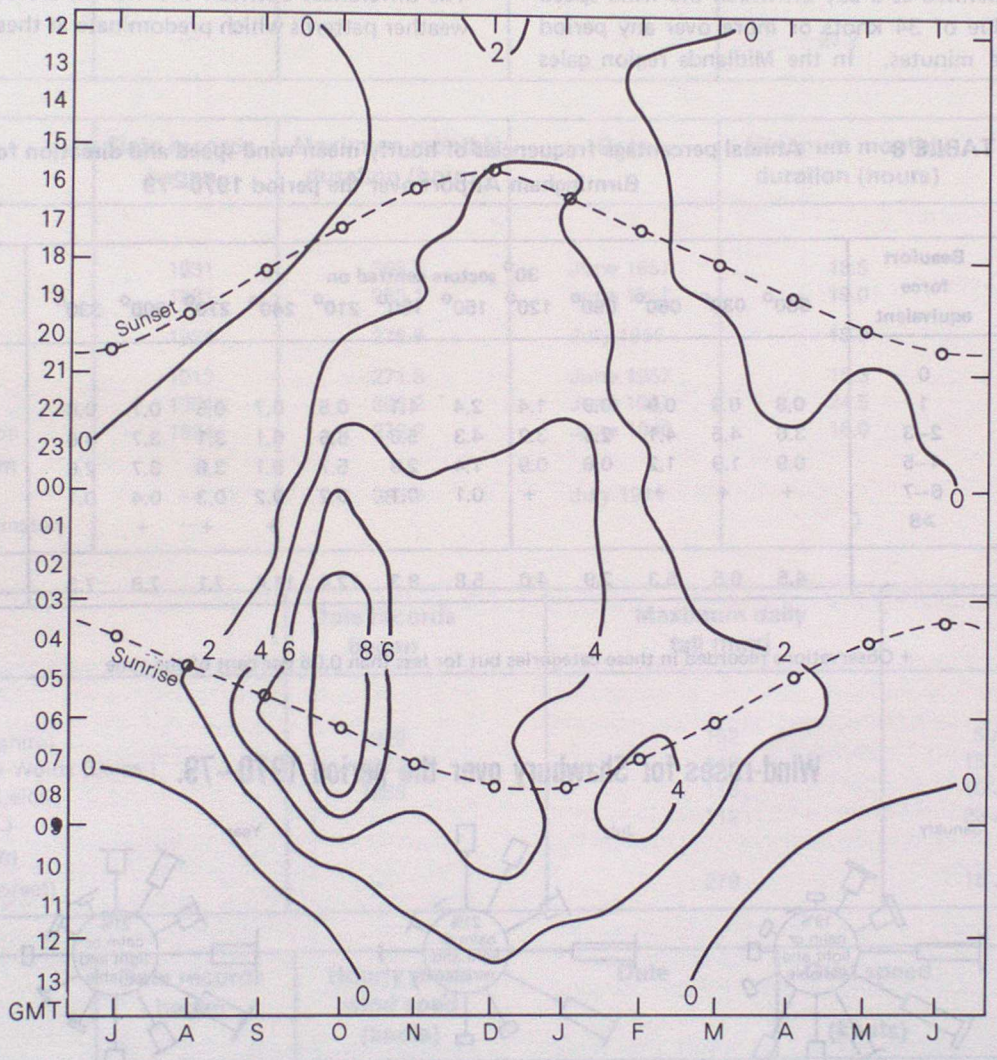



**TABLE 7** Average number of days in each month and the year with visibility of less than 1000 metres at 0900 GMT at selected sites in the Midlands over the period 1961–78

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Newport | 2.4 | 1.3 | 1.2 | 0.3 | | 0.1 | | 0.2 | 1.2 | 2.5 | 1.6 | 2.1 | 12.9 |
| Newtown Linford | 3.5 | 3.3 | 1.9 | 0.8 | 0.2 | 0.2 | 0.1 | 0.1 | 0.6 | 3.3 | 3.0 | 3.3 | 20.3 |
| Caldecott | 4.2 | 4.7 | 3.5 | 0.8 | 0.7 | 0.1 | 0.1 | 0.1 | 2.1 | 5.4 | 3.6 | 4.4 | 30.2 |
| Stone | 5.2 | 4.3 | 2.9 | 1.4 | 0.2 | 0.4 | 0.6 | 1.4 | 2.9 | 5.7 | 4.7 | 6.4 | 35.6 |

# WIND

The wind direction is that from which the wind blows, given either as a compass point or in degrees clockwise from the north. Wind speeds are measured in knots (1 knot = 1.15 mph, 1 metre per second = 1.94 knots) and are closely related to the pressure distribution. The strongest winds are associated with the passage of depressions across or close to the British Isles. As the frequency of depressions is greatest during the winter months this is when the strongest winds normally occur.

Wind seldom occurs as a smooth flowing airstream and eddies give variations both in direction and speed. Winds are usually stronger by day than by night because of the increased turbulence caused by the temperature rise making the wind more gusty and average speeds higher.

A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of ten consecutive minutes. In the Midlands region gales occur on about two days a year on average but nearer to five days in the more exposed lower Severn valley and over high ground.

Table 8 gives the percentage annual frequency of wind speeds in Beaufort force ranges against 30-degree directions of wind for Birmingham Airport for the years 1970–79. This distribution is reasonably typical of the region. Although it cannot be deduced from this table, all the occasions of gale-force winds occurred in the months November, December and January.

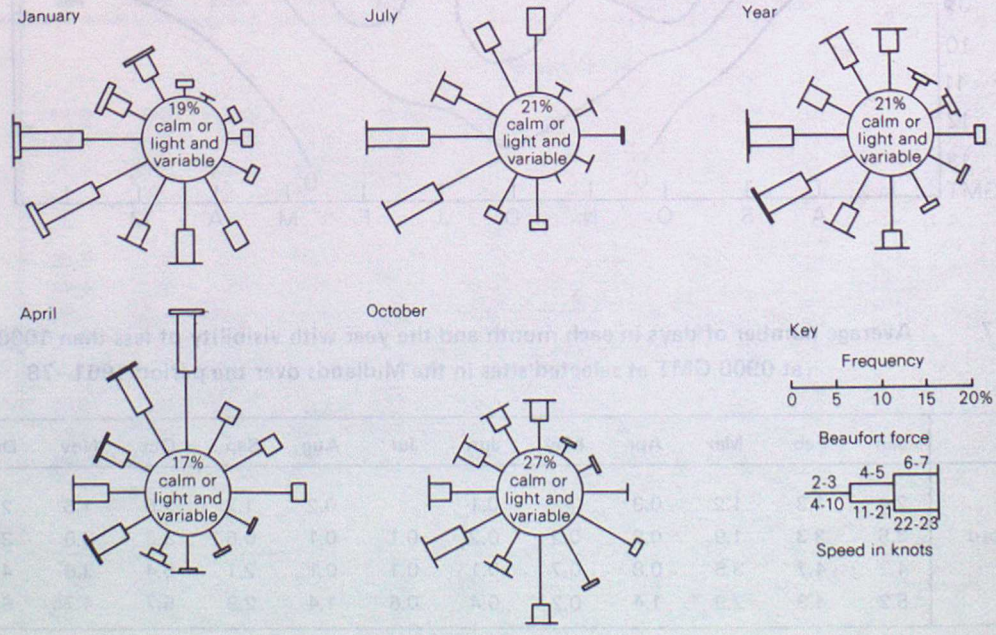
The wind-roses for four months at Shawbury are shown below to illustrate how the wind varies throughout the year. The predominance of the west to south-westerly winds is evident as is the high frequency of northerly winds in April. The differences between the months are due to the different weather patterns which predominate at these times.

**TABLE 8** **Annual percentage frequencies of hourly mean wind speed and direction for Birmingham Airport over the period 1970–79**

| Knots | Beaufort force equivalent | 30° sectors centred on 360° | 030° | 060° | 090° | 120° | 150° | 180° | 210° | 240° | 270° | 300° | 330° | All directions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Calm | 0 | | | | | | | | | | | | | 3.4 |
| 1–3 | 1 | 0.8 | 0.9 | 0.9 | 0.9 | 1.4 | 2.4 | 1.1 | 0.5 | 0.7 | 0.5 | 0.7 | 0.8 | 13.3 |
| 4–10 | 2–3 | 3.6 | 4.5 | 4.1 | 2.3 | 3.2 | 4.3 | 5.3 | 6.6 | 6.1 | 3.1 | 3.7 | 4.6 | 51.4 |
| 11–21 | 4–5 | 0.9 | 1.9 | 1.2 | 0.6 | 0.9 | 1.4 | 2.9 | 5.7 | 5.1 | 3.6 | 3.7 | 2.6 | 30.3 |
| 22–33 | 6–7 | + | + | + | + | + | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.4 | 0.1 | 1.5 |
| ⩾34 | ⩾8 | | | | | | | | | + | + | + | | + |
| Total ⩾4 | | 4.5 | 6.5 | 5.3 | 2.9 | 4.0 | 5.8 | 8.3 | 12.4 | 11.4 | 7.1 | 7.8 | 7.3 | 83.3 |

\+ Observations recorded in these categories but for less than 0.05 per cent of the time

## Wind-roses for Shawbury over the period 1970–79.



## TABLE 9 Weather extremes

| TEMPERATURE | Date records began | Maximum daily temperature (°C) | Date | Minimum daily temperature (°C) | Date |
|---|---|---|---|---|---|
| **Midlands** | | | | | |
| Cheltenham | 1901 | 35.9 | 3 July 1976 | −20.1 | 14 January 1982 |
| Edgbaston | 1901* | 34.4 | 9 August 1911 | −11.7 | 21 January 1940 |
| Newport | 1928 | 32.0 | 3 July 1976 | −26.1 | 10 January 1982 |
| Raunds | 1904 | 36.7 | 9 August 1911 | −18.3 | 13/14 December 1920 |
| Ross-on-Wye | 1914† | 32.8 | 12 July 1923<br>19 August 1932 | −19.4 | 13 December 1981 |
| Sutton Bonington | 1924 | 32.8 | 29/30 July 1948<br>12 August 1953 | −16.7 | 21 January 1940 |
| **United Kingdom** | | | | | |
| Raunds<br>Epsom<br>Canterbury | — | 36.7 | 9 August 1911 | | |
| Braemar | — | | | −27.2 | 11 February 1895<br>10 January 1982 |

| SUNSHINE | Date records began | Maximum monthly duration (hours) | Date | Minimum monthly duration (hours) | Date |
|---|---|---|---|---|---|
| **Midlands** | | | | | |
| Cheltenham | 1931 | 308.5 | June 1957 | 18.5 | November 1945 |
| Edgbaston | 1931 | 283.1 | June 1957 | 19.0 | January 1960 |
| Newport | 1928 | 278.6 | July 1955 | 15.9 | February 1965<br>December 1956 |
| Raunds | 1912 | 271.8 | June 1957 | 15.3 | December 1956 |
| Ross-on-Wye | 1931† | 306.2 | June 1957 | 24.5 | November 1945 |
| Sutton Bonington | 1924 | 272.2 | June 1940 | 16.0 | December 1960 |
| **United Kingdom** | | | | | |
| Eastbourne | — | 383.9 | July 1911 | | |
| London (Westminster) | — | | | 0 | December 1890 |

| RAINFALL | Date records began | Maximum daily fall (mm) | Date |
|---|---|---|---|
| **Midlands** | | | |
| Rodsley (Derbyshire) | 1929 | 152 | 5 August 1957 |
| Waltham-on-the-Wolds (Leics.) | 1872 | 146 | 15 July 1937 |
| Belvoir Castle (Leics.) | 1855 | 116 | 15 July 1937 |
| Fleckney (Leics.) | — | 112 | 23 August 1865 |
| **United Kingdom** | | | |
| Martinstown (Dorset) | — | 279 | 18 July 1955 |

| WIND | Date records began | Hourly mean wind sped (knots) | Date | Gust speed (knots) | Date |
|---|---|---|---|---|---|
| **Midlands** | | | | | |
| Birmingham A/P | 1961 | 44 | 2 January 1976 | 73 | 2 January 1976 |
| Edgbaston | 1924** | 38 | 16 March 1947<br>30 November 1954 | 73 | 23 November 1938 |
| Shawbury | 1972 | 43 | 2 January 1976 | 69 | 2 January 1976 |
| Nottingham W.C. | 1969 | 38 | 2 January 1976 | 71 | 2 January 1976 |
| **United Kingdom** | | | | | |
| (Low level sites) | | | | | |
| South Gare (Cleveland) | — | 70 | 2 January 1976 | | |
| Kirkwall (Orkney) | — | | | 118 | 7 February 1969 |

Records ceased: *1979 †1975 **1978

**TABLE 10** Climatological data for places in the United Kingdom based on the period 1941–70 except where indicated

| | Altitude (metres) | Average annual rainfall (mm) | Average daily temperatures (°C) # | | | | Average annual duration of bright sunshine (hours) | Average annual no. of days with* | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Minimum | | Maximum | | | Air frost | Snow lying |
| | | | Jan. | July | Jan. | July | | | |
| **England** | | | | | | | | | |
| Abingdon (Oxfordshire) | 69 | 605 | 0.3 | 11.6 | 6.3 | 21.6 | 1544 | 57 | 13 |
| Acklington (Northumberland) | 42 | 644 | 0.0 | 10.3 | 5.5 | 17.9 | 1429 | 60 | 20 |
| Birmingham Airport (W. Midlands) | 96 | 679 | 0.1 | 11.2 | 5.7 | 20.5 | 1385 | 62 | 15 |
| London (Kensington Palace) | 25 | 640 | 1.7 | 13.3 | 6.6 | 22.2 | 1384[x] | 35 | 7 |
| Manchester Airport (Gr. Manchester) | 75 | 819 | 0.5 | 11.7 | 5.8 | 19.6 | 1334 | 47 | 10 |
| Plymouth/Mount Batten (Devon) | 27 | 990 | 3.1 | 12.7 | 8.3 | 19.0 | 1678 | 25 | 3 |
| Shawbury (Shropshire) | 72 | 670 | 0.0 | 11.2 | 6.0 | 20.2 | 1368 | 63 | 17 |
| Southsea (Hampshire) | 2 | 702 | 2.4 | 13.9 | 7.1 | 20.7 | 1748 | 25 | 6 |
| Waddington (Lincolnshire) | 68 | 598 | 0.1 | 11.6 | 5.2 | 20.3 | 1503 | 54 | 18 |
| **Wales** | | | | | | | | | |
| Cardiff/Wales Airport (S. Glamorgan) | 67 | 947 | 1.3 | 11.9 | 6.6 | 19.3 | 1571 | 36 | 8 |
| Valley (Gwynedd) | 10 | 871 | 2.5 | 12.0 | 7.5 | 18.1 | 1612 | 27 | 3 |
| **Northern Ireland** | | | | | | | | | |
| Belfast Airport (Antrim) | 68 | 912 | 0.6 | 10.7 | 6.1 | 18.1 | 1281 | 53 | 9 |
| **Scotland** | | | | | | | | | |
| Aberdeen Airport (Grampian) | 58 | 872 | −0.9 | 9.6 | 5.0 | 17.5 | 1341 | 75 | 30 |
| Balmoral (Grampian) | 283 | 834 | −2.8 | 8.1 | 3.7 | 17.4 | 1120[†] | 116 | 63 |
| Edinburgh Airport (Lothian) | 35 | 677 | −0.6 | 10.3 | 5.7 | 18.5 | 1294 | 66 | 14 |
| Lerwick (Shetland) | 82 | 1172 | 0.6 | 9.3 | 5.0 | 14.0 | 1067 | 53 | 32 |
| Stornoway (Western Isles) | 3 | 1094 | 1.3 | 10.1 | 6.4 | 15.7 | 1244 | 49 | 11 |
| Glasgow Airport (Strathclyde) | 5 | 991 | 0.1 | 10.8 | 5.8 | 18.6 | 1266 | 58 | 6 |

* Based on 1956–70 only.
x For Regents Park.
† For Braemar.

# Referring to 24-hour (09–09 GMT) extremes. Adjustments have been made to those stations normally recording night minimum (21–09 GMT) and day maximum (09–21 GMT). See Introduction to the series.

## CLIMATOLOGICAL SERVICES AVAILABLE FROM THE METEOROLOGICAL OFFICE

The Meteorological Office collects and archives regular weather reports from a national network of observing stations, consisting of both Meteorological Offices manned by professional staff and co-operating stations operated by interested organizations or individuals. All these data are subjected to close scrutiny before being archived, to ensure consistency of standards, and are then available to meet the needs of the community.

Any undertaking which is at all weather-sensitive can benefit from a prior knowledge of the climate within which it is expected to operate. The building industry can use past weather statistics to estimate likely delays on contracts, architects and civil engineers need to know the likely extremes of weather which a design must withstand, and many industrial processes are dependent on atmospheric conditions for their success. The agricultural industry uses such information for a variety of purposes, many relating to the viability of new crops and the weather-related incidence and spread of pests and diseases.

In addition to special analyses of weather data for these purposes, the Meteorological Office can supply factual statements on weather conditions for legal or insurance purposes.

Enquiries related to aspects of past weather data should be directed to the appropriate address given on the back cover or, if more convenient, initially to your local weather centre (see opposite). Charges for the supply of information depend mainly on the staff time taken to meet the request.

### Further information

Information leaflets and brochures describing in more detail the range of specialized services available from the Meteorological Office are available free from the same addresses. These leaflets and brochures also indicate the range of complex analyses that the Meteorological Office can undertake.

### Forecasting services

For the day-to-day planning of outdoor work, special weather forecasts and warnings can be arranged to cover specific weather elements at agreed sites. Details may be obtained from:

The Director-General
Meteorological Office (Met O 7a)
London Road
Bracknell
Berkshire RG12 2SZ

or from your local weather centre.

# WEATHER CENTRES AND PUBLIC SERVICE OFFICES

## Weather Centres

**Bristol**
The Gaunts House
Denmark Street
Bristol BS1 5DH

Bristol (0272) 279272

**Cardiff**
Southgate House
Wood Street
Cardiff CF1 1EW

Cardiff (0222) 390420

**Glasgow**
33 Bothwell Street
Glasgow G2 6TS

041—248 7272

**Leeds**
Oak House
Park Lane
Leeds LS3 1EL

Leeds (0532) 457703

**London**
284–286 High Holborn
London WC1V 7HX

01—430 5627

**Manchester**
Exchange Street
Stockport SK3 0ER

061—477 1017

**Newcastle**
Newgate House
Newgate Street
Newcastle-upon-Tyne NE1 5UQ

Tyneside 091—232 3808

**Norwich**
Rouen House
Rouen Road
Norwich NR1 1RB

Norwich (0603) 630164

**Nottingham**
Main Road
Watnall
Nottingham NG16 1HT

Nottingham (0602) 384094

**Southampton**
160 High Street-below-bar
Southampton SO1 0BT

Southampton (0703) 220646

## Public Service Offices

**Meteorological offices at:**

Aberdeen Airport
Dyce, Aberdeen AB2 0DU

Aberdeen (0224) 724986

Belfast (Aldergrove) Airport
Belfast
Northern Ireland BT29 4ABA

Crumlin (084 94) 52804

Birmingham Airport
Birmingham B26 3QN

021—743 6240

Kirkwall Airport
Orkney KW15 1TH

Kirkwall (0856)3802

Sella Ness
Port Admin Area
Sullom Voe
Shetland ZE2 9QR

(0806) 242069

Royal Air Force Mount Batten
Plymouth
Devon PL9 9SH

Plymouth (0752) 493377

# THE CLIMATE OF GREAT BRITAIN

This memorandum is one of a series which will cover the whole of Great Britain in due course, published in the Climatological Memoranda range. The Introduction (CM 113) to the series explains how various weather elements are measured. The areas to be covered are:

## SCOTLAND

114 Borders Region
115 Edinburgh, Lothian Region and Stirling
116 Fife, Dundee and Perth
117 Aberdeen and Buchan
118 Moray Firth coastal Region
119 Northern Isles
120 Western Isles
121 Skye and the North-west
122 Argyll and the Inner Hebrides
123 The Grampians and Perthshire Highlands
124 Glasgow and the Clyde valley
125 Ayrshire and the Firth of Clyde
126 Dumfries and Galloway Region

## ENGLAND

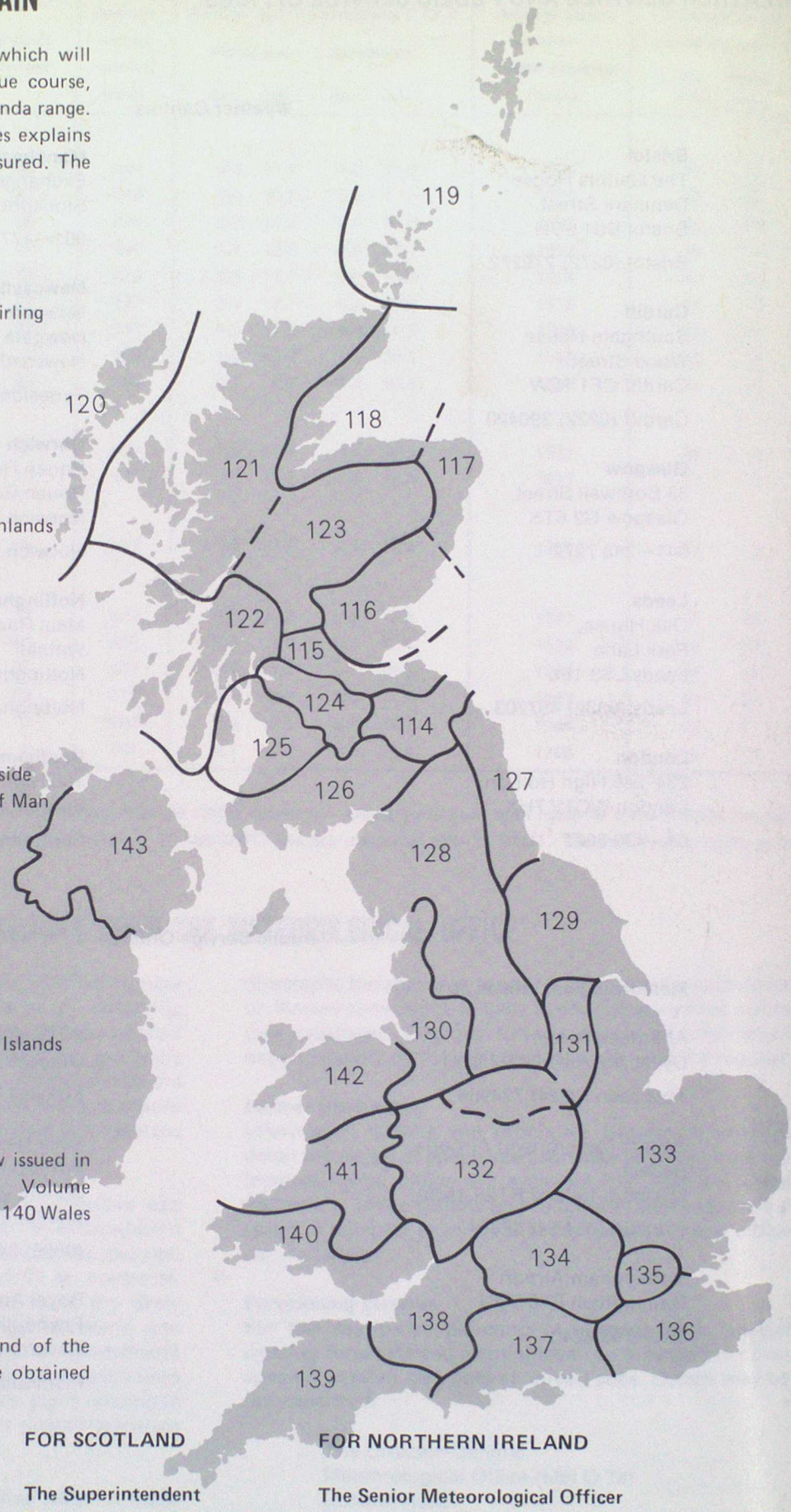
127 North-east England
128 Pennines and Lake District
129 East Yorkshire and North Humberside
130 Lancashire and Cheshire and Isle of Man
131 Trent Valley
132 Midlands
133 East Anglia and Lincolnshire
134 Thames Valley
135 London
136 South-east England
137 South England
138 Somerset and Avon
139 South-west Peninsula and Channel Islands

## WALES

140 South Wales
141 Mid Wales
142 North Wales and Anglesey

} Now issued in one Volume No. 140 Wales

Also available
143 The Climate of Northern Ireland




Further details of these memoranda and of the services mentioned on page 16 can be obtained from:

**FOR ENGLAND AND WALES**

**The Director-General**
**Meteorological Office (Met O 3b)**
**London Road**
**Bracknell**
**Berkshire RG12 2SZ**

**FOR SCOTLAND**

**The Superintendent**
**Meteorological Office**
**231 Corstorphine Road**
**Edinburgh EG12 7BB**

**FOR NORTHERN IRELAND**

**The Senior Meteorological Officer**
**Meteorological Office**
**Progressive House**
**1 College Square East**
**Belfast BT1 6BQ**